

REMARKS

The applicant respectfully requests reconsideration in view of the amendment and the following remarks. The applicant has amended claims 13, 16 and 17 as suggested by the Examiner in order to overcome the claim objections.

Claims 13, 16 and 17 are objected to because of informalities. Claims 1-21, 26, 28-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo et al. (5,840,217) ("Lupo") with evidence supplied by Towle (4,898,983) ("Towle"). Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo as applied to claim 1-21, 26, 28-29 above, and further in view of Pedersen et al. The applicant respectfully traverses these rejections.

Claim Objections

Claims 13, 16 and 17 are objected to because of informalities. The applicant appreciates the Examiner pointing out these informalities. The applicant has amended claims 13, 16 and 17 as suggested by the Examiner in order to overcome the claim objections. For the above reasons, this objection should be withdrawn.

Claim Rejections - 35 USC § 103

Claims 1-21, 26, 28-28 are rejected as being unpatentable over Lupo with evidence supplied by Towle. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lupo as applied to claim 1-21, 26, 28-29 above, and further in view of Pedersen et al.

Lupo is discussed in the applicant's specification at page 1, line 18. Lupo discloses the synthesis of different acetyl derivatives of 9,9'-spirobifluorene. The pending claims differ from Lupo in that aroyl substituted (A-C=O) spirobifluorenes are claimed in the applicant's claimed invention. This has the effect that both the efficiency as well as the operational lifetime of the device is considerably increased as shown by the experimental results in the declaration filed January 31, 2008. See in particular, paragraph nos. 20 and 21 of the declaration which establish the unexpected results of aroyl substituted spirobifluorene compared to the acetyl substituted spirofluorene according to Lupo.

The technical problem to be solved is therefore to supply electron transporting materials, which result in an increased efficiency and lifetime compared to materials according to the state of the art.

Lupo did not recognize that some of the disclosed materials suffer from insufficient performance when used in an organic electroluminescent device, in particular with respect to operational lifetime, and need further improvement. They do not teach how to modify the disclosed materials in order to improve their properties.

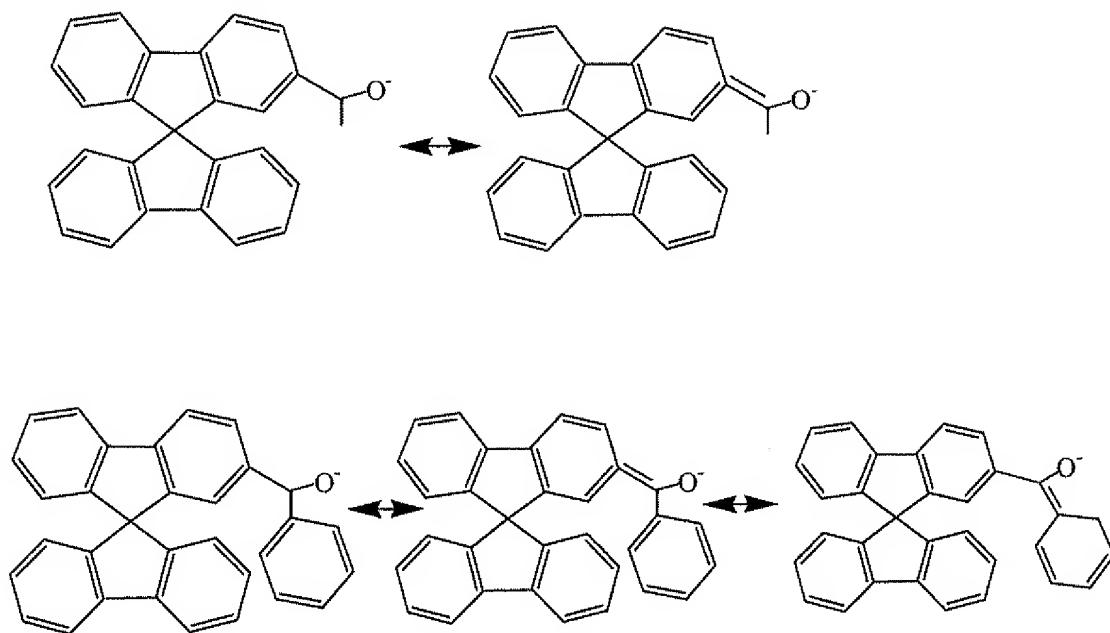
Also the teaching by Towle would not lead to the present invention as Towle only discloses a method for preparing aryl carbonyl compounds. The only given uses for these compounds are the preparation of poly(arylene ether ketones) (see column 1, lines 10-11) and as chemicals or chemical intermediates in pharmaceutical and agricultural chemicals, dyestuffs and chemical additives (see column 1, lines 31-34). Towle does not give any indication that aryl carbonyl compounds might be useful for organic electronic devices. Therefore, the only aspect a person skilled in the art can learn from Towle is that it is possible to prepare aryl carbonyl compounds by electrophilic aromatic substitution, which in fact was already known for several decades as the acylation reaction by Friedel and Crafts is already very old. The person of ordinary skill in the art does however not learn from Towle that these compounds might be useful in organic electronic devices.

Neither Lupo nor Towle give any suggestion or hint that the use of aroyl substituted spirobifluorene derivatives might lead to particularly improved properties of the organic electroluminescent device compared to acetyl substituted spirobifluorenes. Assuming arguendo that a person of ordinary skill in the art would have combined Lupo with Towle, the person skilled in the art would not have any incentive to do so when trying to find a solution for his technical problem to improve efficiency and lifetime of the organic electroluminescent device as the person would not have any reasonable expectation of success. The person of ordinary skill in the art would therefore never have expected that aroyl substituted spirobifluorenes give better results than the corresponding acetyl substituted spirobifluorenes.

However, the surprisingly unexpected results of the inventive compounds are dearly shown by the further experimental results, which were submitted in the declaration filed January 31, 2008. The examiner doubts that the experimental results based on a single compound are sufficient to support the full scope of the claims (see page 7, last line of paragraph no. 20 of the

office action). However, as the other inventive compounds are structurally closely related to compound E2 in the declaration, they will all show the same technical effect.

The applicant has informed the undersigned the following: one possible reason for the better performance of the inventive compounds compared to the corresponding acetyl compounds might be based on the better mesomeric stabilization of the corresponding radical anion. Even though the acetyl compound is stabilized by mesomerism as well, the stabilization in this compound seems not to be sufficient to obtain a high operational lifetime. Some mesomeric structures of the acetyl and the benzoyl compound are shown in the following (not all possible structures are shown):



Therefore, in the aroyl substituted compound, not only the spirobifluorene part of the molecule gives rise to mesomeric stabilization of the compound, but also the aryl of the aroyl group. The higher mesomeric stabilization might be one reason for the higher stability and therefore longer operational lifetime of the device.

Another reason for the higher operational lifetime might be based on the increased steric hindrance of the carbonyl group in the aroyl compound compared to the acetyl compound. Due to less steric shielding of the carbonyl group in the acetyl compound, this group is more reactive,

e.g. giving rise to dimerization of two carbonyl radical anions, which are formed in the organic electronic device.

Another reason for the lower operational lifetime of the acetyl compound compared to the aroyl compound might be based on the fact that the acetyl compound comprises an acidic CH₃ group, which might react in the presence of a radical anion in the organic electronic device and might lead to by-products thus lowering the operational lifetime.

The applicant has informed the undersigned that the above statements are true for all compounds according to the present invention and not only for compound E2 in the declaration. This results in an increased operational lifetime of all inventive compounds.

According to the discussion above, the compounds as claimed in claim 1 as well as in dependent and related claims 2 to 19 are therefore not obvious in view of the prior art. As the compounds themselves are inventive, the same is true for the method for preparing the compounds (claims 20, 21 and 25) as well as electronic devices comprising the compounds (claims 26 and 28). For the above reasons, these rejections should be withdrawn.

In view of the above, applicant believes the pending application is in condition for allowance.

Applicant believes no fee is due with this response. However, if a fee is due, please charge our Deposit Account No. 03-2775, under Order No. 14113-00105-US from which the undersigned is authorized to draw.

Dated: April 7, 2008

Respectfully submitted,

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